AD-A123 071 GENERIC CODING OF ITEMS WITH CHANGING PRODUCTION LEADTIMES(U) ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY FORT LEE VA P J HIGGINS ET AL. AUG 82 1/1

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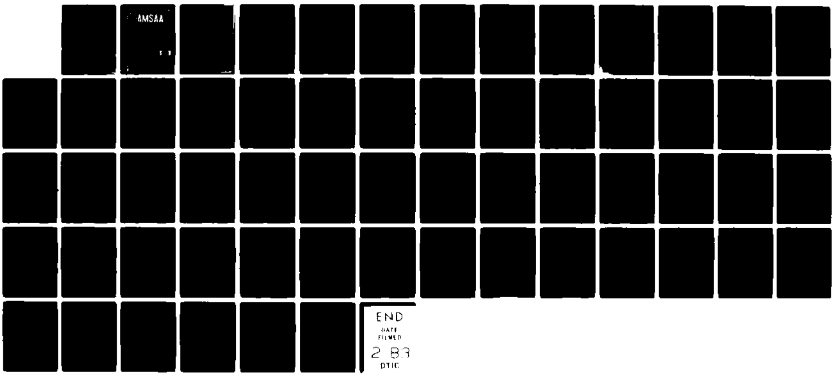

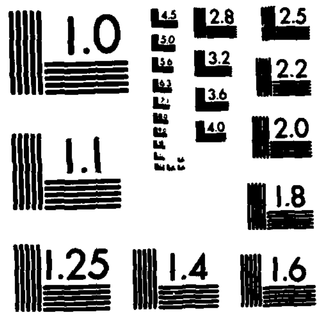

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LOGISTICS STUDIES OFFICE

PROJECT NUMBER 033

FINAL REPORT

GENERIC CODING OF ITEMS WITH CHANGING PRODUCTION LEADTIMES

AUGUST 1982

U. S. ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY
LOGISTICS STUDIES OFFICE
FORT LEE, VIRGINIA 23801

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A123071	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Generic Coding of Items with Changing Production Leadtimes		5. TYPE OF REPORT & PERIOD COVERED Final Report
		6. PERFORMING ORG. REPORT NUMBER LSO Project 033
7. AUTHOR(s) Peter J. Higgins, Uldis Rex Poskus		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Director, US Army Materiel Systems Analysis Activity, ATTN: DRXSY-FLSO Fort Lee, VA 23801		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Troop Support & Aviation Materiel Readiness Command, ATTN: DRSTS-PLET 4300 Goodfellow Blvd., St. Louis, MO 63120		12. REPORT DATE August 1982
		13. NUMBER OF PAGES 62
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for Public Release; Distribution Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Production Leadtime; Generic Coding; Data Base; Procurement

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The generic coding concept proposed by the US Army Troop Support and Aviation Materiel Readiness Command (TSARCOM) is evaluated in this report. The concept was developed to assist that command in reacting to drastic changes in production leadtimes caused by changes in the availability of materials, manufacturing processes, and subcomponents. This evaluation concludes that the concept is feasible; however, implementation should await the results of the concept test and evaluation to be performed by TSARCOM.

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ABSTRACT

The generic coding concept proposed by the US Army Troop Support and Aviation Materiel Readiness Command (TSARCOM) is evaluated in this report. The concept was developed to assist that command in reacting to drastic changes in production leadtimes caused by changes in the availability of materials, manufacturing processes, and subcomponents. This evaluation concludes that the concept is feasible; however, implementation should await the results of the concept test and evaluation to be performed by TSARCOM.

Report Title: Generic Coding of Items With Changing Production Leadtimes

Study Number: LSO 033

Study Initiator and Sponsor: US Army Troop Support and Aviation Materiel Readiness Command
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St Louis, MO 63120

ACKNOWLEDGEMENTS

This study was performed under the direction of Mr. J. Allen Hill, Program Manager of the Logistics Studies Office (LSO), US Army Materiel Systems Analysis Activity (AMSAA). Mr. Richard Green of the US Army Troop Support and Aviation Materiel Readiness Command was the study sponsor representative. We wish to thank Mr. Green for his support and guidance during this study, Mr. Peter MacDonough for programing assistance, Mrs. Jewel Loftis for typing this study and Mrs. Constance H. Myers for administrative support.

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FIGURES

EXECUTIVE SUMMARY

1. Authority for the Study. The Director for Plans, Doctrine, and Systems (DRCPS-S), US Army Materiel Development and Readiness Command (DARCOM), tasked the Logistics Studies Office to perform this study by letter, DRCPS-C, 13 July 1981, subject: Study Topics for Logistics Studies Office (LSO). The Director of Procurement and Production (P&P), US Army Troop Support and Aviation Materiel Readiness Command (TSARCOM), is the study sponsor.

2. Problem Statement. Recent history shows drastic fluctuation (mainly increases) of production leadtimes for many items. Production leadtime instability impedes the ability of inventory managers to accurately forecast the balance of assets and requirements. Historical production leadtime (PLT) information in many cases was far less than the current PLT which resulted in a zero balance of assets before replacement stock was received.

3. Objective. The objective of this study is to evaluate the TSARCOM generic code concept and recommend any necessary improvements.

4. Methodology.

a. A bibliographic search was performed to determine if completed, ongoing, or planned efforts in this or related areas were documented. Selected research reports and regulatory documents were reviewed for background materiel and relevant concepts or procedures.

b. The TSARCOM concept was meticulously reviewed for flaws and desirability.

c. Personal and telephonic interviews were conducted with individuals knowledgeable with the procurement process.

d. Visits and discussions were held with private industry and other services.

5. Findings, Conclusions, and Recommendations.

a. Findings.

(1) The Joint Aeronautical Materiel Activity receives information monthly from the US Department of Commerce regarding the price and leadtimes of certain materials.

(2) Industrial trade publications are a valuable source of production leadtime information.

(3) Grumman Aerospace Corporation is operating a system to group homogeneous items (e.g., transistors) regardless of material or function. While group averages are used, each item within a group is managed individually in an attempt to overcome the impact of leadtime changes.

(4) The US Air Force Logistics Command is doing a generic coding study which is not finished at this time.

(5) No system for generic coding, similar to this concept, was found.

b. Conclusions.

(1) The generic code concept is feasible.

(2) The generic code concept will assist the timely substitution of materials, processes, or subcomponents.

(3) The generic code concept can be programmed and will operate once data files are properly initialized.

c. Recommendation. Full implementation of this concept should await successful results of the concept test and evaluation performed at the US Army Troop Support and Aviation Materiel Readiness Command.

CHAPTER 1

INTRODUCTION

1. Background and Problem.

a. Background.

(1) The thousands of items needed on a daily basis to maintain a ready Army are procured by the US Army Materiel Development and Readiness Command (DARCOM) from private enterprises. Manufacturers willing and able to produce these items usually have related commercial business which competes for their finite production capacity. Producers also have time constraints that are dependent on production capacities which further limits their ability to satisfy Army requirements.

(2) If DARCOM item managers are unable to maintain adequate operating levels of their assigned items, requisitions will not be satisfied in a timely manner and premium prices must be paid to expedite procurement. Army managed items have a unique identifier, the National Stock Number (NSN) or a manufacturer's part number (for purposes of this report NSN will be used as including part numbers). Each NSN is individually managed through the Supply Control Study (SCS) process. The level of management given any NSN depends upon the item's criticality to the force and on its total forecast annual demand in dollars which are indicated by the Study Method Code. SCS which result in a procurement decision justify creation of a funding document called the procurement work directive (PWD) which drives the acquisition process.

(3) The funds required to procure materiel are limited and should therefore be expended only after careful consideration of all available information. One important element of data in the SCS and procurement processes is production leadtime (PLT). Production leadtime is defined in AR 710-1, Centralized Inventory Management of the Army Supply System, paragraph 4-18e(2), as follows:

"Production leadtime (PLT) is the time from the date of the contract to the date of receipt of the first significant contract delivery. A significant delivery consists of a quantity equal to, or greater than one third of the total procurement work directive quantity or procurement subline value, as applicable. Nonrepresentative PLTs such as expedited deliveries and extended delays to include contracts in litigation, strikes, and natural disasters will be excluded from use in requirements determination. The current PLT will be computed by using the last representative procurement action (PLT portion); or by using PLT value in the signed contract; or if representative procurement actions are not available within the last 18 months, by using representative PLTs for similar items. The determination of which of the above PLT computations is most representative will be made at the time requirements are computed. Contractor estimates will not be used."

b. Problem.

(1) Fluctuating PLTs can cause severe budgetary, acquisition, and inventory problems to both wholesale and retail levels of supply. PLT increases usually were found to be caused by a reduction in the availability of a material, manufacturing process, or subcomponent essential in the fabrication of an item. These increases cause more severe problems than decreases in terms of their effect on supply availability and price. This was particularly evident at the US Army Troop Support and Aviation Materiel Readiness Command (TSARCOM) in the later part of the 1970s. Because there was no convenient method of relating information affecting PLT from one item to other items, a tedious search was necessary to identify items which had common reasons for changing PLTs.

(2) Personnel at TSARCOM developed a concept to alleviate this problem. The original concept is at Appendix C. Briefly, the concept stated:

"If there was a coding system which described critical materials (i.e., titanium, cobalt, etc.), processes (i.e., forgings, castings, etc.), and subcomponents (i.e., bearings, hydraulic actuators, etc.), which affect leadtime for a given NSN, it would improve visibility in leadtime management. When a manager received information that the availability of material had increased/decreased he could inquire CCSS to obtain a listing of NSNs that would be affected, and, through in-house review or queries to prime/secondary contractors, validate the impact and modify leadtimes accordingly."

(3) The more accurate the PLT data is in the Commodity Command Standard System (CCSS), then the more accurate are the supply control studies and budget stratifications produced by that system. Inaccurate PLT information results in incorrect requirements determination. It is normally too late in the preaward phase of the acquisition process before the PLT inaccuracy is discovered for the problem to be resolved. More accurate forecasts can be expected when new PLT information is used in supply control studies and the budget stratification of other NSNs.

c. Administrative Background. An In-Process Review (IPR) was held in April 1982 with representatives from DARCOM, TSARCOM (sponsor), the Army Procurement Research Office, and the Logistics Studies Office (LSO) (study agency). An agreement was reached regarding the conduct of this study. The scope of the study was limited exclusively to TSARCOM and it was decided that only critical materials, manufacturing processes, and subcomponents would be coded. It was also decided to permit TSARCOM to test the concept using live data on a weapon system of their choice (see Appendix E). A Strategic, Critical, and Precious Materials List (Appendix D) was proposed by the study agency at the IPR as a first attempt in defining the materials to be coded in the system. The lists of materials, manufacturing processes, and components selected by TSARCOM for their test of the concept are at Appendix F.

2. Objective. The objective of this study is to evaluate the TSARCOM generic code concept and recommend any necessary improvements.

3. Methodology.

a. A bibliographic search failed to produce any completed studies on this subject. An Air Force Logistic Command (AFLC) Study, Generic Coding, was conducted concurrently with this study. The AFLC study was narrow in scope and

limited to six critical materials used in jet engines. The application was seen as extending to other aircraft parts as experience was gained. The most immediate information and need was with jet engines. Several reports and articles were reviewed which concerned the problem of constrained sources of critical materials, processes, engineers, and skilled labor (Appendix B). While interesting as background information, the bibliographic search failed to add to the concept or aid in its evaluation.

b. Interviews were conducted with personnel at the Grumman Aerospace Corporation, the Government-Industry Data Exchange Program (GIDEP) and within DARCOM. Grumman is using a generic type system for purchased items which is unique to its requirements. Talks with GIDEP personnel revealed it to be a clearinghouse of manufacturing information not well suited to the generic code system described by TSARCOM.

CHAPTER 2

TSARCOM CONCEPT

1. TSARCOM Generic Code Concept.

a. Periods of fluctuating production leadtimes compound the problems of timely and efficient management of the acquisition of DARCOM inventories of parts and components. Changing markets for materials and industrial capacities increase the difficulty of maintaining accurate leadtime information in CCSS.

b. While leadtime information for materials and industrial capacities is available, CCSS is not programmed to use or provide this information. Recognizing this void, TSARCOM developed a concept to apply material and industrial leadtime information to the PLT of items having some commonality. The TSARCOM concept would apply "...a generic identification number for each NSN...." The code format contained several digits divided into three categories. The form of TSARCOM's generic code is:

```
                                    XX - XX - XXXXX
Material ___________________________|    |     |
Manufacturing Process ___________________|     |
Subcomponent __________________________________|
```

where the Xs represent the alphanumeric codes.

c. TSARCOM did not recommend any coding system for either materials or manufacturing processes but did suggest the Government-Industry Data Exchange Program (GIDEP) as a potential source for the subcomponent code. Items for which one or more categories are not appropriate would be left blank.

d. The central idea driving the TSARCOM generic code concept is that PLT increases or decreases are directly influenced by changes in the availability of material(s), manufacturing process(es), or subcomponent(s). Items can be grouped by the various generic categories when these elements are coded. As availability

for one or more elements changes, a listing of affected NSNs can be obtained and the PLT of each reviewed. The PLT within CCSS for these NSNs would then be changed if necessary so that a more reliable PLT would be available to the Requirements Determination and Execution System (RD&ES).

e. The concept paper (Appendix C) provided by TSARCOM was general in nature and did not provide details of how such a system would work or how benefits could be measured. The concept was enhanced by LSO where necessary.

f. Chapter 3 of this report limits and also amplifies the TSARCOM concept. It adds details required before evaluation of the concept could begin.

CHAPTER 3

GENERIC CODE CONCEPT-AMPLIFIED

1. The scope of the original TSARCOM concept was modified before evaluation began. This chapter modifies and further develops the concept originally proposed by TSARCOM.

a. Limitations. To avoid smothering this system by requiring voluminous coding, the number of materials, manufacturing processes, and subcomponents are restricted to those judged to be of critical or strategic importance. These limitations facilitate the coding of NSNs by reducing the task to a manageable level. This restriction also effectively reduces the number of NSNs eligible for inclusion.

b. Concept Rationale. The primary reason for the generic code system is to enable the Army to anticipate PLT changes for items which are generically similar to other items experiencing PLT changes. Generic similarity will be based on selected critical materials, manufacturing processes,and subcomponents. While this system is reactive rather than predictive in nature, the information will permit the Army to anticipate PLT changes for items sharing the generic code of the characteristic(s) causing the leadtime change. To accomplish this objective, it is necessary to list all NSNs which share a common element of the generic code. Without the ability to cross-reference a generic code to a stock number, information on leadtime changes is of limited value. As discussed below, there are other benefits in addition to improving leadtime management.

(1) Occasionally it is necessary or desirable to substitute one material or process for another due to its limited availability. It is impossible to quickly compile a complete list of items containing a specific material, process,

or subcomponent. If implemented completely, generic coding will help overcome this shortcoming for those characteristics which are coded. This system will allow listing NSNs so that substitution of a more plentiful (or inexpensive) material can be evaluated (though the methodology for this procedure is outside the scope of the current study).

(2) Budgetary shortfalls may occur as PLTs increase and excessive inventories may result when PLTs decrease. If significant PLT increases occur after the yearly budgetary levels are decided, a larger expenditure of funds than budgeted is required or future supply availability may be reduced. Also, as PLTs increase it appears that the forces of supply and demand cause additional price increases. The price rise, coupled with an increase in requirements, causes increases in acquisition costs which result in budgetary shortfalls. Decreasing PLTs reduce the Requirements Objective (RO) and may lead to supply control studies which indicate an excessive inventory position.

(3) Increased visibility and application of the most current PLT information will improve TSARCOM's ability to efficiently manage its resources. Generic coding will not only reduce unnecessary acquisitions, but will improve TSARCOM's ability to procure those assets which are manufactured from critical materials and components or, by critical manufacturing processes. Thus, TSARCOM will be able to improve supply availability and reduce costs of holding and disposing of excessive inventories.

c. Amended Coding Format. The format was expanded to include the NSN. The amended format appears as:

Characteristic Code

XX - XX - XXXXX - 1234-00-123-1234

Material

Manufacturing Process

Subcomponent

National Stock Number

(1) Items containing multiple critical materials, manufacturing processes, and/or subcomponents will be coded using multiple lines of generic codes. An illustration of this situation (without codes) would appear as follows:

Material	Process	Subcomponent	NSN
Titanium	Forging	-	1234-00-123-1234
Aluminum	Forging	-	1234-00-123-1234
-	Casting	-	1234-00-123-1234
-	-	Bearing	1234-00-123-1234

Two materials require a forging process (titanium and aluminum), the casting process is coded even though the material is not (the material cast is not critical in this situation), and neither the material or process were critical for the bearing. This simple example indicates the versatility which multiple coding lines permits since the necessity for combining multiple critical elements is eliminated. The example also demonstrates the ease of listing the NSN. If it is desired to list only the NSNs containing titanium, the program will search the entire file for titanium and completely print each line of code found, including the NSN. Naturally, the program can be written to print the line in whatever format desired.

(2) As a problem in availability for a specific material, process, and/or subcomponent becomes known, the computer program will be used to query the generic code file for all entries containing the desired code. The complete line of coded information including the NSN will be printed (or displayed on a computer monitor) for each NSN linked to the desired code.

(3) To allow for later expansion it was decided that several blank spaces would be left after each characteristic code. This will permit expansion of element codes by using organizations which decide to modify the initial characteristic code when unique requirements become known. One use for these spaces is shown in Chapter 6 of this report.

CHAPTER 4

GENERIC SYSTEM OPERATION

1. Current Acquisition Process. To understand the order in which acquisition events occur, a simplified flowchart of the current processing of PWDs by Procurement and Production is provided at Figure 1.

a. The flowchart and accompanying narrative do not include actions which precede the procurement process such as the Requirements Determination and Execution System (although RD&ES is cited). The numbering system used on the flowchart corresponds to the following:

Block 1.0. The funded Procurement Work Directive is received within the Procurement and Production (P&P) Directorate and the acquisition process begins. This document identifies the item to be procured (NSN and nomenclature), the number to be procured and the standard unit price as well as other vital information.

Block 2.0. Personnel within P&P determine when production will begin and ascertain the length of time production is expected to take based on information obtained from prospective producers or from historical records. Using this information it is possible to change the PLT in the CCSS Fixed Header. This can be accomplished by a Document Identifier Code (DIC) YXZ (Administrative and Procurement Leadtime Transaction). The dotted line on the flowchart from Block 2.0 to Block 2.1 and on to Block 7.0 indicates that a PLT change is not always necessary.

Block 3.0. The contract is awarded to the successful bidder and this point is referenced as the end of the Administrative Leadtime (ALT) and the beginning of the Production Leadtime (PLT).

Block 4.0. The Estimated Delivery Schedule is abstracted to Sector 51 of the CCSS to provide a basis against which to measure actual deliveries.

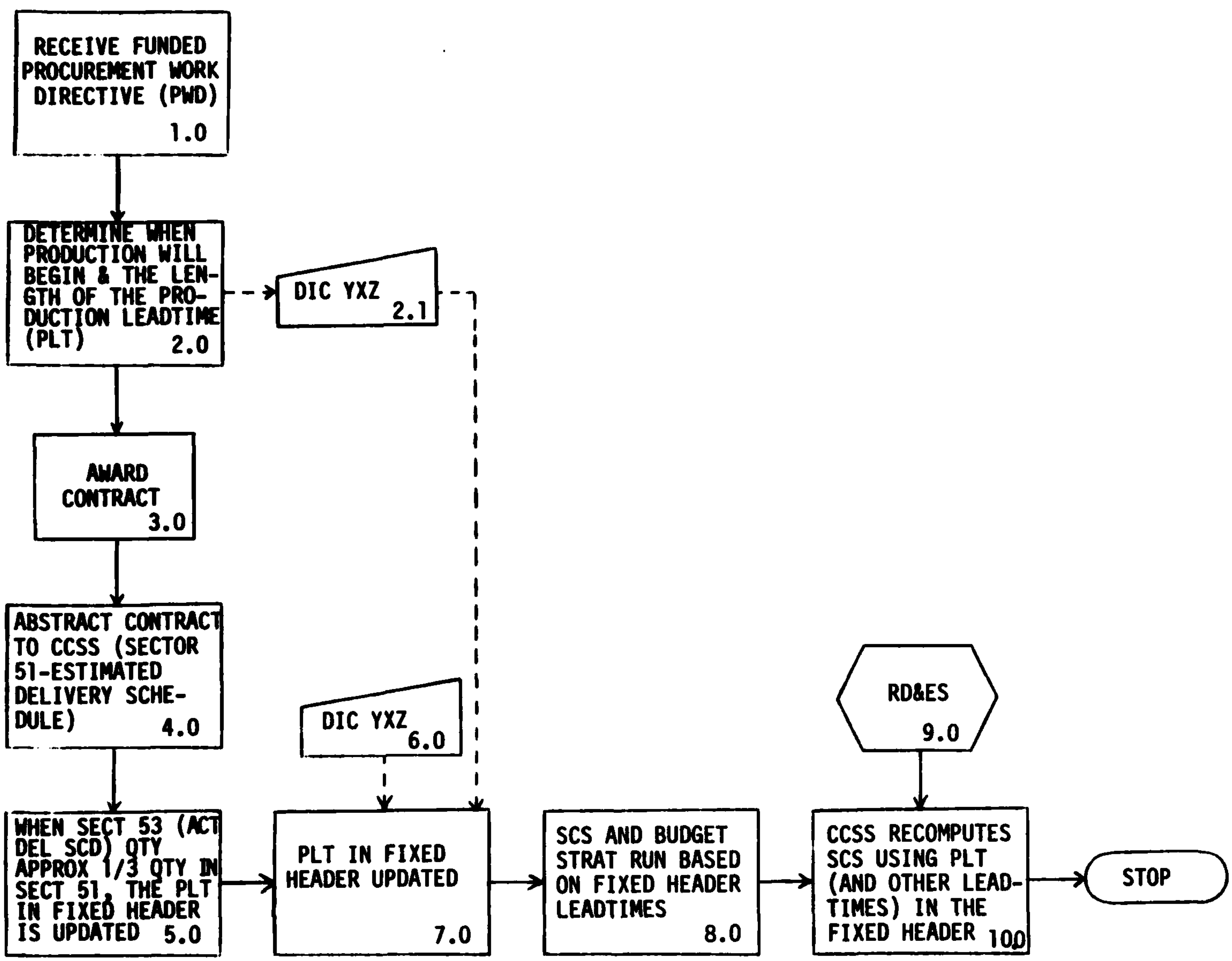


FIGURE 1

DESCRIPTION OF CURRENT SYSTEM

<u>Block 5.0</u>. Actual materiel receipts are entered in Sector 53 of CCSS (Actual Delivery Schedule). Sectors 51 and 53 are compared and when one-third of the quantity as shown in Sector 51 is received (indicated by Sector 53) the PLT in the Fixed Header of CCSS is updated automatically.

<u>Block 6.0</u>. The DIC YXZ can be used to change the PLT in CCSS at anytime.

<u>Block 7.0</u>. The Fixed Header PLT can be changed either manually or by automatic computer update. The manual method requires the use of DIC YXZ. This is accomplished as the need to amend the PLT in the Fixed Header record of CCSS becomes known. The automatic update occurs when the quantity received and entered in Sector 53 of CCSS equals one-third of the quantity entered in Sector 51.

<u>Block 8.0</u>. The PLT in the Fixed Header (whether changed or not) will be used in Supply Control Studies and the Budget Stratification.

<u>Block 9.0</u>. The Requirements Determination and Execution System (RD&ES) of CCSS recomputes Supply Control Studies cyclically (and as requested) using the PLT (and other leadtimes) in the Fixed Header (Block 10.0).

<u>Block 10.0</u>. The inventory manager in Materiel Management reviews the SCS (and Budget Stratifications) and performs all necessary actions, including the amendment of outstanding Procurement Work Directives.

2. <u>Proposed Acquisition Process with Generic Coding</u>. The addition of a generic coding system to the acquisition process at DARCOM Materiel Readiness Commands (MRCs) is envisioned as a two-phase addition to the present system.

a. Phase I - Initialization of Generic Coding System (Figure 2) - Certain specific actions and decisions must be accomplished before generic coding is ready for implementation. Phase I actions should be developed concurrently as they are not sequential in nature and Phase II cannot be started until Phase I is complete. Phase I includes:

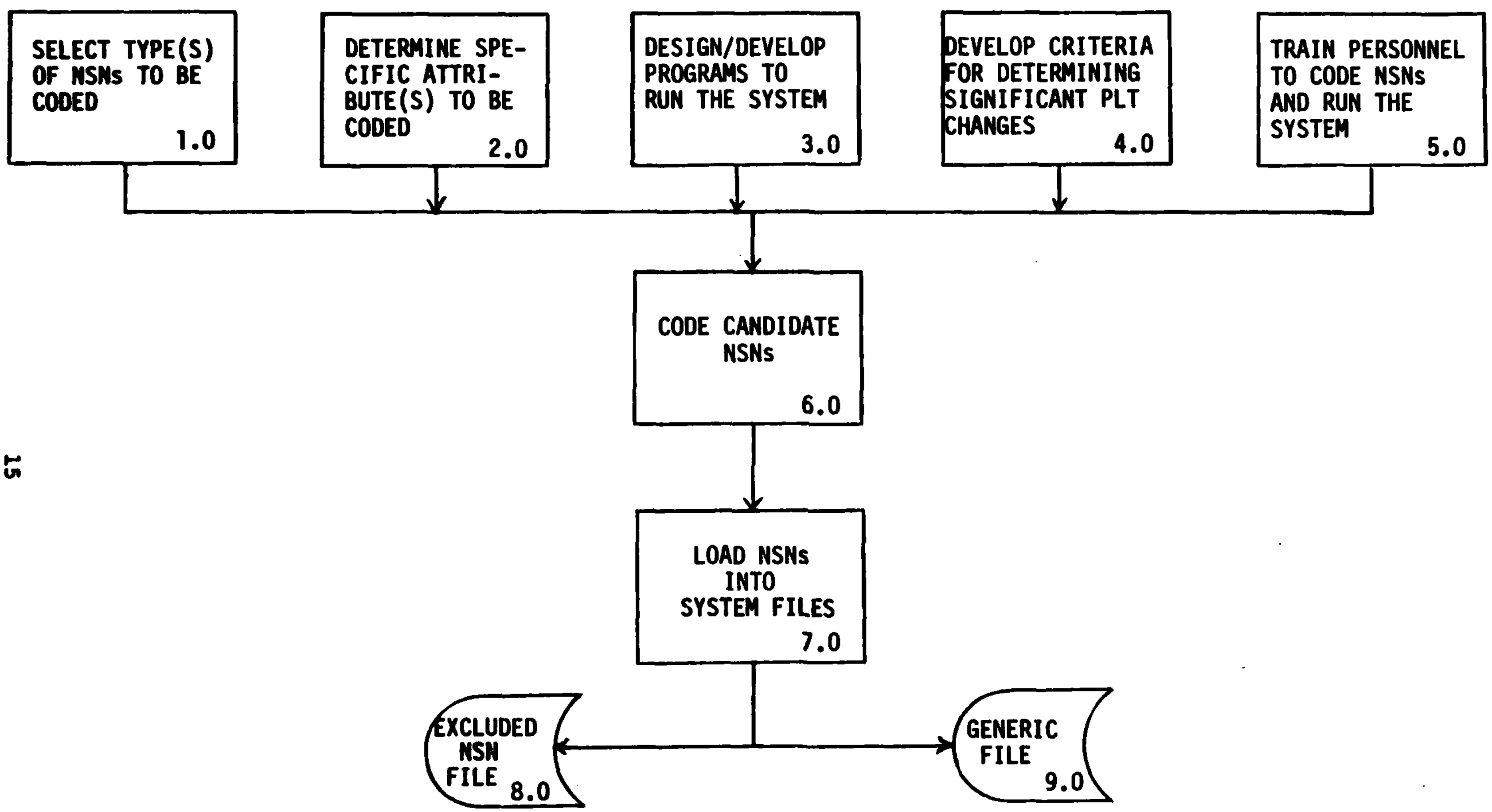


FIGURE 2

INITIALIZATION OF GENERIC CODING SYSTEM

<u>Block 1.0</u>. Selection of NSNs to be coded. Initial selection of NSNs is important in order for the system to maximize the payoff. Those NSNs of greatest value--both in monetary and operational terms--should be selected to provide the corpus of the generic system. In time all NSNs will be evaluated on a discovery basis in which the NSN on each PWD will be checked against the lists of coded and excluded NSNs. If the NSN has not already been entered into the Generic File or into the Excluded NSN File (failure to meet selection criteria), it will be coded so long as other coding criteria are met. These criteria are explained in the following subparagraph.

<u>Block 2.0</u>. Determine specific attributes to be coded. Initially a list of materials, manufacturing processes, and subcomponents must be developed. In time, experience will aid in refining these lists. As (materials, manufacturing processes, and subcomponents) availabilities change or new elements become known, the list of coded elements will be modified. A significant and necessary action required in this selection process includes assigning unique codes to each material, manufacturing process, and subcomponent. Ideally the particular codes selected would already be in use to avoid duplicative efforts. However, possible future enhancement/modification of the coding structure indicates that "uniqueness" will creep into the coding system. Therefore, code selection will be performed with the intention of promoting long term benefits to the operation of the generic system. The listing of materials, manufacturing processes, and subcomponents selected initially for this system are listed at Appendix F.

<u>Block 3.0</u>. Design/develop generic system computer programs. Computer programs must be designed and developed to operate the generic system. The magnitude of work involved in operating the generic coding system precludes a manual

system when it is in full operation. Cooperation between all organizations involved is necessary to insure that computer programs are designed and written to make full use of the system. This portion of Phase I includes designing a fully operational computer system complete with routines to enable users to build and amend files.

Block 4.0. Develop criteria for determining significant PLT changes. Decision rule criteria must be developed for determining excessive variance to the PLT recorded in the Fixed Header in CCSS so that records can be changed when necessary. These criteria are important to avoid unnecessary changes. The availability of an element (whether material, process, or subcomponent) common to many coded items might frequently change by minor amounts. If the PLT of each NSN (coded for that element) is changed by insignificant amounts, then excessive numbers of record changes will result with negligible benefit but with potential for error. In order to avoid this situation, decision rules limiting PLT record changes to significant changes are necessary.

Block 5.0. Train personnel to code NSNs and run system. Personnel must be selected and trained to code NSNs generically and to ensure the information is added to the Generic File. Users must also be trained to access and use the information. The user may also be the encoder of the information.

Block 6.0. Code candidate NSNs. Upon selection of the NSNs, determination of the specific materials, processes, and subcomponents, and the training of personnel, the coding process may begin. During initial system implementation and operation, the selection of NSNs will be limited to high payoff groups. After the initial group of NSNs is encoded, new ones will be added on a discovery basis.

Block 7.0. Load coded NSNs into Generic File. Encoded NSNs will be loaded into the Generic File. Those NSNs which do not contain a material,

subcomponent or require a manufacturing process to be coded will be loaded into a file of excluded NSNs. Loading of coded and uncoded NSNs into the appropriate files will conform to the rules for system operation.

Block 8.0. Candidate NSNs which contain no critical materials or subcomponents and are not manufactured by a critical process will be placed in an Excluded NSN File. The importance of this file will increase with its size. As PWDs are received, the first step in the operational generic code system will be a check to determine if the NSN is already in the Generic File. If it is not, the Excluded NSN File will be checked to determine if the NSN was previously evaluated and found ineligible for coding. This two-step check will avoid time-consuming re-evaluation of NSNs.

Phase I ends upon completion of the actions discussed above. All Phase I operations should be completed prior to full scale operation of the generic system described as Phase II.

b. Phase II - Normal Operation of Proposed System (Figure 3). The reader should note and remember that the proposed generic coding system supplements the existing CCSS and acquisition process. This is signified by the off-page connector out of Block 3.0 (contract award) on page 1 of Figure 3. Operation of the generic system begins on page 2 of Figure 3.

Block 3.1.0. Is NSN coded in the system? The generic system blends smoothly into the Procurement and Production Directorate's processing of PWDs and the first step is to determine if the NSN in question has previously been coded and loaded into the Generic File. Inherent to this question is the action of checking the Generic File. If the answer is no, then the next questions are:

Block 3.1.1. Was it previously excluded? Was the NSN previously reviewed for inclusion and found not to qualify for inclusion in the Generic File?

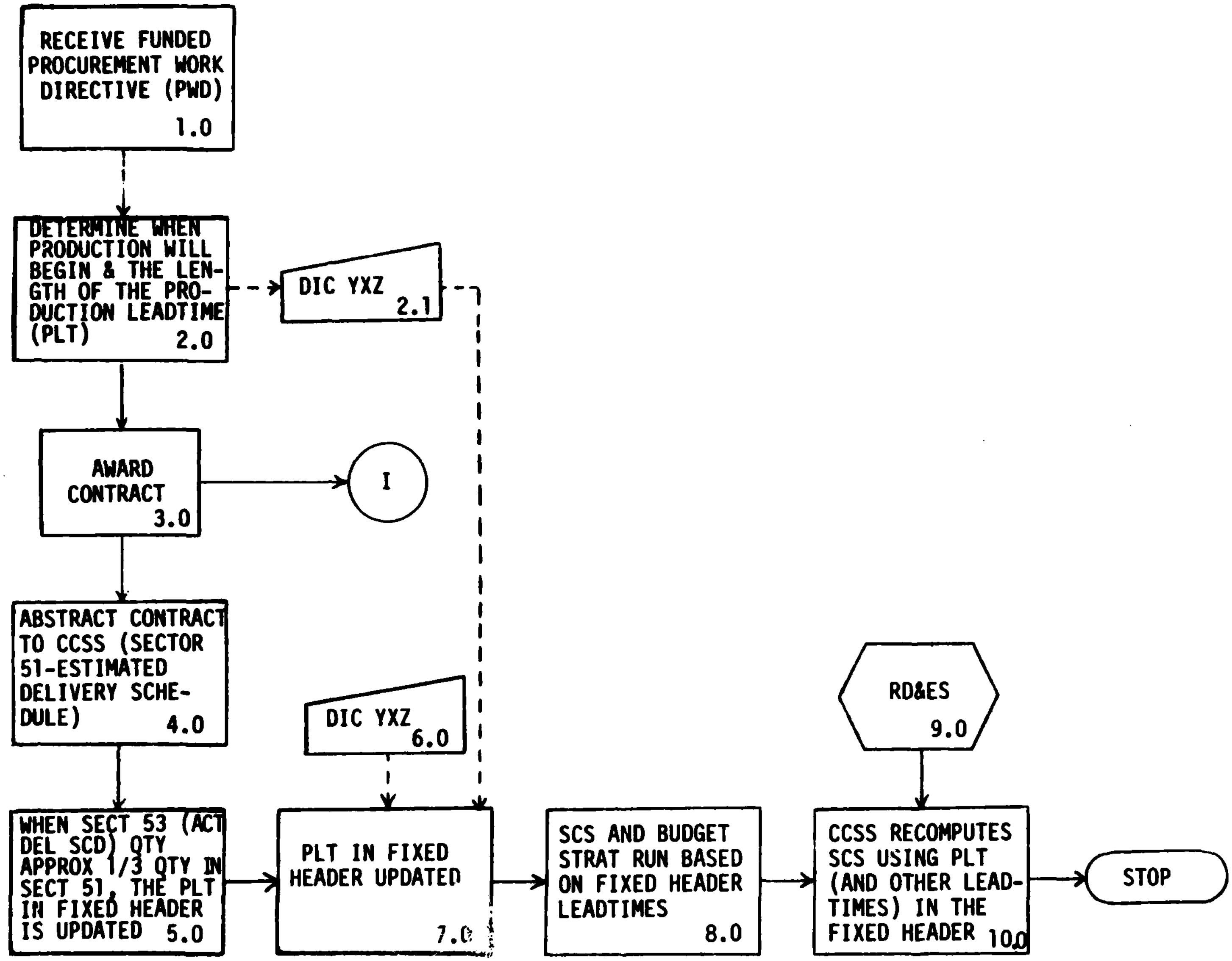
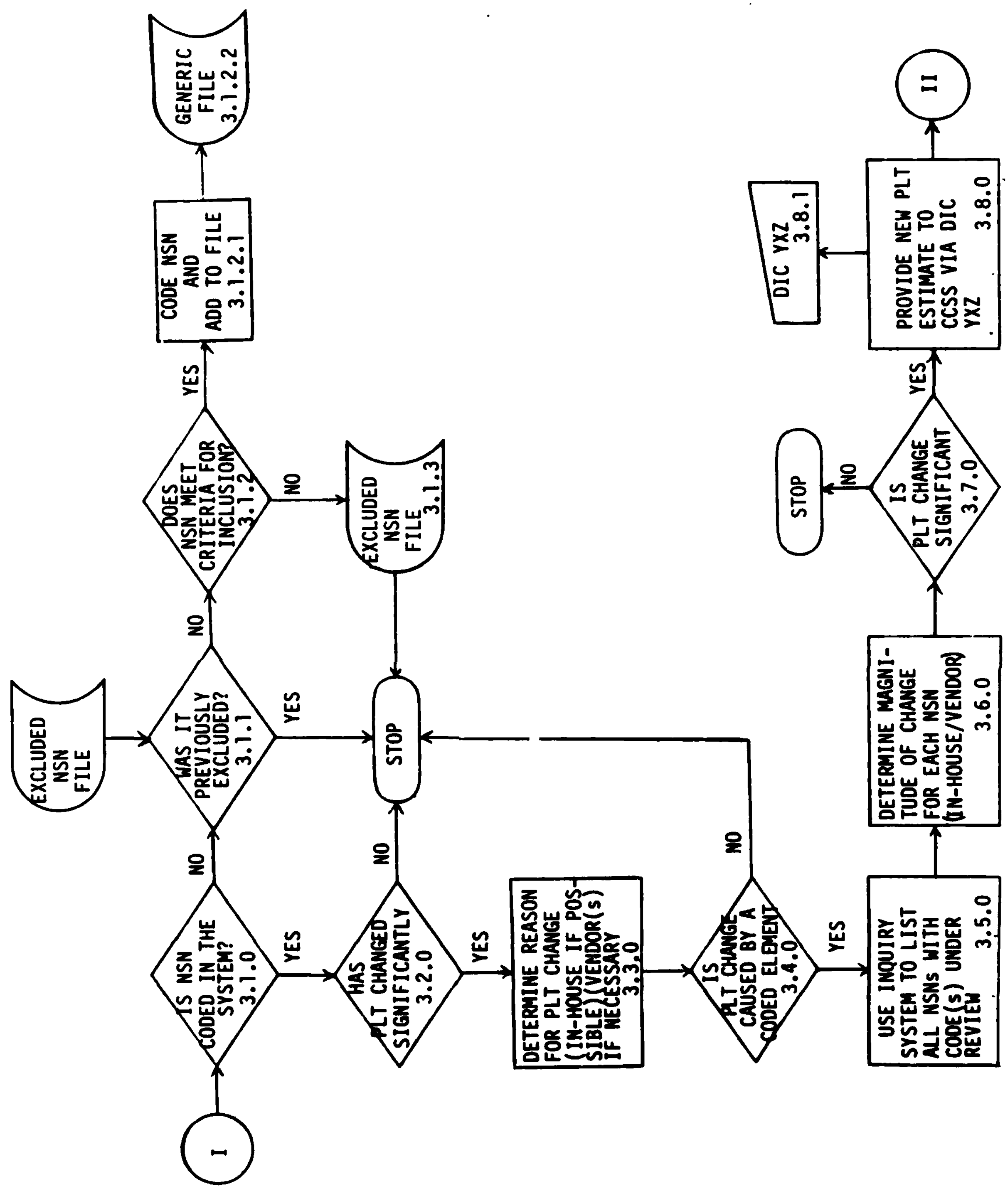
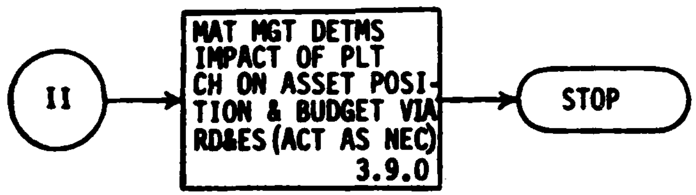


FIGURE 3

NORMAL OPERATION OF PROPOSED SYSTEM



I
IS NSN CODED IN THE SYSTEM? 3.1.0
NO
YES
EXCLUDED NSN FILE
WAS IT PREVIOUSLY EXCLUDED? 3.1.1
NO
YES
DOES NSN MEET CRITERIA FOR INCLUSION? 3.1.2
YES
NO
CODE NSN AND ADD TO FILE 3.1.2.1
GENERIC FILE 3.1.2.2
EXCLUDED NSN FILE 3.1.3
STOP
HAS PLT CHANGED SIGNIFICANTLY 3.2.0
NO
YES
DETERMINE REASON FOR PLT CHANGE (IN-HOUSE IF POSSIBLE)(VENDOR(s) IF NECESSARY 3.3.0
IS PLT CHANGE CAUSED BY A CODED ELEMENT 3.4.0
NO
YES
USE INQUIRY SYSTEM TO LIST ALL NSNs WITH CODE(s) UNDER REVIEW 3.5.0
DETERMINE MAGNITUDE OF CHANGE FOR EACH NSN (IN-HOUSE/VENDOR) 3.6.0
IS PLT CHANGE SIGNIFICANT 3.7.0
NO
STOP
YES
PROVIDE NEW PLT ESTIMATE TO CCSS VIA DIC YXZ 3.8.0
DIC YXZ 3.8.1
II


II
MAT MGT DETMS
IMPACT OF PLT
CH ON ASSET POSI-
TION & BUDGET VIA
RD&ES (ACT AS NEC)
3.9.0
STOP

The answer is yes if the NSN is found in the Excluded NSN File and no further action is necessary. If the NSN was not previously excluded, the procedure moves on to Block 3.1.2.

Block 3.1.2. Does the NSN meet criteria for inclusion? Each NSN must be evaluated against selection criteria and those failing to meet the criteria will be excluded. Excluded NSNs are added to the Excluded NSN File (Block 3.1.3). All NSNs will be evaluated with respect to the critical characteristics and as Block 3.1.2.1 indicates, the NSN will be coded and added to the Generic File shown at Block 3.1.2.2.

Block 3.2.0. If the answer to the question in Block 3.1.0 (Is the NSN coded in the system?) is yes, the next question which must be asked is: Has the PLT changed significantly? (Block 3.2.0). To answer this question the new PLT must be compared to the PLT recorded in CCSS and the difference evaluated by use of the decision rules in effect. If the PLT change is not significant, then no further generic code effort is necessary. However, if the change is significant, then the next action is found in Block 3.3.0.

Block 3.3.0. Determine reason for PLT change. The cause of the PLT change should be determined either from "in-house" sources or if necessary by contacting one or more vendors. Once the reason for a significant PLT change is determined, this information will be used to aid in the procurement process. The cause(s) of significant PLT change must be evaluated and is accomplished in Block 3.4.0.

Block 3.4.0. Is PLT change caused by a coded element? Labor strikes, transportation problems, Acts of God, and similar reasons cause the inquiry process to terminate with a negative response. If the PLT change is caused by a coded element(s) the specific generic code(s) should be identified and listed. A positive result leads directly to Block 3.5.0 on the flowchart.

Block 3.5.0. Use inquiry system to list all NSNs with code(s) under review. The generic code system should be instructed to list all NSNs sharing the code(s) of the factor(s) discovered to cause a PLT change.

Block 3.6.0. Determine magnitude of change for each NSN. Each NSN listed should be evaluated either in-house or with the assistance obtained from vendors to ascertain the magnitude of difference between the PLT in the Fixed Header of CCSS and the PLT which could be expected if an order was placed.

Block 3.7.0. Is PLT change significant? An analyst must evaluate the magnitude of change for the PLT of each NSN and determine if the change is significant using the decision rules previously mentioned (Block 3.2.0). If the change is not significant, then no further action is necessary for that NSN and the next NSN listed can be evaluated. If the PLT change is significant (based on the decision rules), the action described in Block 3.8.0 should occur.

Block 3.8.0. Provide new PLT estimate to CCSS via DIC YXZ. If evaluation of the magnitude of change to the PLT of an NSN is determined to be significant, then the PLT recorded in the Fixed Header of CCSS should be amended. Supply Control Studies and Budgetary Stratifications then can be performed using the most recent information. The DIC YXZ is the manual method to update the PLT, shown by Block 3.8.1.

Block 3.9.0. Material Management uses Supply Control Studies to analyze asset positions and to determine what actions are necessary. Managers can check the result of PLT changes by simple calculation to ascertain the "bottom line" differences between the new and old leadtime information.

3. The narrative in paragraph 2 explains the sequence of actions to be taken with the generic code system in operation at TSARCOM. Extension of this system from TSARCOM to all DARCOM Materiel Readiness Commands may require modification

due to local procedures. In keeping with command prerogative, modifications should be permitted if justifiable. The framework of the operational system portrayed in the flowcharts should not be considered inflexible.

CHAPTER 5

CONCEPT EVALUATION

1. Criteria. This evaluation concerns only the possibility (or impossibility) of the generic code concept proposed by TSARCOM and expanded by the Logistics Studies Office. Evaluation of this concept requires that specific criteria be identified. The criteria and evaluation are:

a. Does regulatory guidance prohibit any part of this concept? For purposes of this study, the definition of production leadtime is taken from AR 710-1 (Centralized Inventory Management of the Army Supply System) and is found in Chapter 1, paragraph 1a(3) of this report. This definition requires a significant amendment to permit implementation of generic coding. The following is suggested:

> "...The current PLT will be computed by using the most current data available whether it is: the last representative procurement action; the PLT value in the signed contract; representative of PLTs for similar items; in-house or contractor estimates.

to replace:

> "...The current PLT will be computed by using the last representative procurement action (PLT portion); or by using PLT value in the signed contract; or if representative procurement actions are not available within the last 18 months, by using representative PLTs for similar items. The determination of which of the above PLT computations is most representative will be made at the time requirements are computed. Contractor estimates will not be used."

b. Is data available? There are a number of data sources to support this concept. Publications such as Purchasing provide weekly summaries on average leadtime availability for many materials. Another valuable source of leadtime information (and acquisition timing) is the United States Department of Commerce. The Department of Commerce analyzes markets for a wide variety of goods and

services and provides this information to interested organizations. The Joint Aeronautical Materials Activity located at Wright-Patterson Air Force Base publishes leadtime information obtained, in part, from the Department of Commerce. An equal or better source of leadtime information can be obtained from manufacturers. Leadtime information gathered from any one source should be evaluated in the light of other available information. This systematic evaluation will provide reliable information which will enhance the Requirements Determination and Execution System.

c. Will the concept satisfy the objective? The enhanced concept was designed to satisfy the objective. However, a live data test of this concept will be performed by TSARCOM to answer this question definitively. This test will include a comparative analysis of test results and those results obtained using the current system of PLT updating.

d. Can the system be designed? So long as the type of results expected are established and proper input information is available and entered, a system can usually be designed to satisfy any purpose given adequate time and resources. Care must be taken to insure the accuracy of the results (validation) because while automation aids timely management, it can also result in quicker mismanagement unless safeguards are designed, enforced, and reviewed. Ultimately, the concept test will provide the answer to this question. Any results showing less than improved PLT management will disprove the concept.

e. Can the system be programmed? A "quick and dirty" test performed within the Logistics Studies Office indicated relative ease in writing a simple computer program to satisfy at least part of this concept. Chapter 6 of this report explains in greater depth the computer programs necessary.

f. Can the system be maintained? This system can be maintained as long as required resources are applied. Maintenance will be made more difficult if

unnecessary "bells and whistles" are added. With adequate training and understanding of the concept, maintenance should not be a problem. If managers and analysts begin relying on this system for solutions instead of for information as intended, then the system's validity will diminish, reliance on it will waver, and it will not be maintained.

g. Can this system be applied to all materials and items? Before using this system to code all items and all materials in those items, an analysis should be performed to determine the payoff. Items with little fluctuation in PLT and no qualifying materials, processes and subcomponents should be added to the Excluded NSN File in the system. Other DARCOM MRCs may find this system useful but requiring modification to the criteria of individual using commands.

h. Will it be necessary to modify CCSS? It is vital that implementation and operation of the generic coding system occur with a full understanding of CCSS. Because the purpose of generic coding is to modify the PLT in CCSS it must be understood that CCSS is a self-policing system. The Materiel Management Decision (MMD) File contains policy control parameters. These parameters are established by weapon system managers and/or materiel management personnel and specify upper and lower limits within which the Requirements Determination and Execution System programs are run. Occasionally the generic coding system may furnish a PLT value exceeding the parameter in the MMD file. CCSS will not use values which exceed a parameter so appropriate weapon system or materiel management personnel must change the value of the parameter accordingly. This points out the need to understand the systems which generic coding may affect. This system may ultimately become part of CCSS.

2. From the above discussion, one must conclude that the generic code concept is feasible. The concept can work if properly implemented and it can provide the type of information desired given the proper resources to develop and operate

the system. These resources include computer programming support, personnel to code and operate the system, and P&P personnel to contact contractors and validate their information. Reducing the scope to exclude items having marginal potential for benefit will avoid system congestion and place emphasis where it is needed. Only the functional possibility of this concept has been evaluated. Design, operation, and maintenance costs are unknown and may prohibit implementation. Results from an unbiased test of the concept will answer questions regarding the net worth of this system.

CHAPTER 6

COMPUTER METHODOLOGY

1. Introduction.

a. This chapter discusses a methodology for implementing the concept discussed above. The discussion is general and there is adequate flexibility in the methodology to permit modifications to it. The intent is to present a means of satisfying the objective of the concept. Thus, the code format may be used as presented here, or it may be expanded, contracted or the sequence, material, process, subcomponent, can be revised without affecting the effectiveness of the methodology.

b. To gain insight and understanding of how a computer could perform the various necessary functions, a simple system was designed using contrived data.

2. Generic Code Composition.

a. The generic code consists of a 34-character field of four ordered parts or codes (i.e., MMM PPP SSS NNNN-NN-NNN-NNNN). In order, a three-character field for material, a three-character field for process, a three-character field for subcomponent, and a sixteen-character field for the National Stock Number. Each of the first three subcodes is followed by a three-character blank field to allow for the addition of qualifiers to the code or for expansion of the code if needed.

b. Each code will contain blanks or zeros in those fields that do not pertain to the NSN or subcomponent within one particular generic code. That is, where a strategic material pertains to the NSN and not to the subcomponent and where the material does not require a critical process, the generic code consists of a material code, two blank code fields (or zero fields) and an NSN field (MMM 000 000 NNNN-NN-NNN-NNNN).

c. Each item represented by an NSN will have as many generic codes as are necessary to define its critical features.

d. The four fields in the code are linked to each other with the NSN being the dominant or base field. This means that where the NSN does not have a critical subcomponent, the material or process refers to the NSN. Where the NSN does have a critical subcomponent, if the subcomponent code is listed, any material or process codes will refer to the subcomponent.

e. The examples below will clarify the coding scheme.

Example 1	012	000	000	1234-00-567-1111

Item with NSN 1234-00-567-1111 contains a strategic material coded 012 and does not require a critical process or have a critical subcomponent.

Example 2	012	000	0ZZ	1234-00-567-2222

Item with NSN 1234-00-567-2222 has a critical subcomponent coded 0ZZ. This subcomponent contains a strategic material coded 012. Since the subcomponent is a part of the item represented by the NSN, the NSN can also be categorized as containing strategic material 012.

Example 3	034	000	0XX	1234-00-567-3333
	034	000	000	1234-00-567-3333
	000	076	000	1234-00-567-3333
	056	098	000	1234-00-567-3333

Item with NSN 1234-00-567-3333 has a critical subcomponent coded 0XX that contains strategic material 034. The next line indicates that the item itself also contains material coded 034. The third line indicates that the item requires critical process 076. The fourth line indicates that the item also has a strategic material coded 056 and that the material requires critical process 098.

f. Note that each code generally conveys one bit of information, either that the item represented by the NSN contains a particular material or subcomponent or requires a process. The exceptions are where a combination occurs such as in a

subcomponent requiring a process or containing a material. By linking the process or material to the subcomponent, more information is conveyed than if this were not done. The NSN is linked to the subcomponent in the code and where a subcomponent contains a critical material, the item represented by the NSN will also contain the material because the subcomponent is a part of the NSN.

g. Those items that have materials or subcomponents that can be substituted contain an additional three-character code to indicate substitutability.

Example: MMM###PPP SSS NNNN-NN-NNN-NNNN

The ### representation in the above code indicates that the material is substitutable. The same NSN will have one or more generic codes indicating which materials are substitutable for the standard material.

h. The data base entries for this situation will look like this:

012A1S000	000	2222-00-222-2222
035A2 000	000	2222-00-222-2222
043B2S000	000	2222-00-222-2222
055B2 000	000	2222-00-222-2222

In the above example, the material code 012A1S indicates that the material can be substituted, (A), and the S indicates that it is the standard, preferred material. The material code 035A2 indicates that it is a substitute material for 012A1S. Note that since material 012A1S has a 1 in the fifth position, the substitution can only be performed in one direction; that is, 035 can be used in place of 012 but 012 cannot be used in place of 035. The substitute codes B2 for materials 055 and 043 indicate that the item with NSN 2222-00-222-2222 contains another strategic material, 043 which is substitutable and interchangeable with material 055. The two-way substitutability is indicated by the 2. The S in the 043B2S material code indicates that this is the standard material. If there were a third substitutable material, it would use codes in the C series to indicate its substitutability.

i. In the search routine, only those codes would be listed that had no substitution codes (011 000 000 1234-00-567-2222) or that had an S in the sixth subcode position to indicate that the material or subcomponent was substitutable but was the standard or preferred (013 000 036A2S5555-00-123-4444).

j. For substitutable subcomponents the scheme is the same:

```
000   000   076A2S3333-00-333-3333
000   000   085A2 3333-00-333-3333
```

k. It is expected that very few substitute entries of this type will be made in the data base.

3. Input Requirements.

a. Data. The materials, processes, and subcomponents to be included in the data base have been discussed before. The lists of materials, processes, and subcomponents will be short to insure that the system does not become overloaded with data that has little usage, and because only relatively few materials, processes, and subcomponents are considered critical.

b. Coding Forms. The input form should serve for both recording the information as it is located and for inputting the information into the data base. An input form was not designed though an example is shown below.

```
--------------------------------------
  M     P     C          NSN
XXX000XXX000XXX000XXXX-XX-XXX-XXXX
```

c. Input Modes. Input can be by means of cards or an interactive terminal. The latter is the recommended method. The individual trained to perform the function would also be responsible for searching the data bases of included and excluded NSNs, when needed.

d. Initial Build of the Data Base. The initial data base will consist of a small sample of about 200 to 400 entries, and about 50 to 100 NSN, selected for interaction with each other. This initial data base will be built to test the system during its development.

e. Subsequent Additions to the Data Base. Once the system is "on-line," the discovery process mentioned in Chapter 4 will be used to bring additional NSNs into the system. Those NSNs that have a strategic material, critical process, or subcomponent are entered into the data base as the item becomes a candidate for an acquisition. Those items which do not fall into the above category are entered into another file (Excluded NSN File). Substitute materials or subcomponents will be added to the data base as this information becomes pertinent or is discovered.

f. Update of the Data Base. Over time, some NSNs will become obsolete and will require removal from the data bases. For this purpose the data base will require updating periodically. Once or twice per year should be sufficient.

4. System Requirements. The programming requirements of a system that could perform the above functions need not be very complicated. The files in the data base must be organized in such a way that a selected code may be located quickly and efficiently and that a search for similar codes can be performed efficiently.

5. System Demonstration.

a. A simple program was written to perform the functions in an interactive mode, using the Beginners All-Purpose Symbolic Instruction Code (BASIC) language. A sample search and a listing of the program may be seen in Appendix G.

b. A listing of subcomponents, materials, and processes that will be used in testing the program as it is developed is included in Appendix F.

6. Output Requirements. Output can be by either hardcopy or video terminal. Searches for all items that require a particular material, process or that have a common subcomponent, may be conducted on any one of the three critical descriptor fields or on any combination of these. It is also possible to search for particular NSNs.

CHAPTER 7

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

1. Findings.

a. The Joint Aeronautical Materiel Activity receives information monthly from the US Department of Commerce regarding the price and leadtimes of certain materials.

b. Industrial trade publications are a valuable source of production leadtime information.

c. Grumman Aerospace Corporation is operating a system to group homogeneous items (e.g., transistors) regardless of material or function. While group averages are used, each item within a group is managed individually in an attempt to overcome the impact of leadtime changes.

d. The US Air Force Logistics Command is doing a generic coding study which is not finished at this time.

e. No system for generic coding, similar to this concept, was found.

2. Conclusions.

a. The generic code concept is feasible.

b. The generic code concept will assist the timely substitution of materials, processes, or subcomponents.

c. The generic code concept can be programmed and will operate once data files are properly initialized.

3. Recommendation. Full implementation of this concept should await successful results of the concept test and evaluation performed at the US Army Troop Support and Avaiation Materiel Readiness Command.

APPENDIX A

LIST OF ACRONYMS AND ABBREVIATIONS

AFLC	Air Force Logistic Command
ALT	Administrative Leadtime
AR	Army Regulation
BASIC	Beginner All-Purpose Symbolic Instruction Code
CCSS	Commodity Command Standard System
DARCOM	US Army Materiel Development and Readiness Command
DIC	Document Identifier Code
GIDEP	Government-Industry Data Exchange Program
IPR	In-Process Review
LSO	Logistics Studies Office
MMD	Materiel Management Decision File
MRC	Materiel Readiness Command
NSN	National Stock Number
PLT	Production Leadtime
P&P	Procurement and Production
PWD	Procurement Work Directive
RD&ES	Requirements Determination and Execution System
RO	Requirements Objective
SCS	Supply Control Study
TSARCOM	US Army Troop Support and Aviation Materiel Readiness Command

APPENDIX B

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APPENDIX C

TSARCOM GENERIC CONCEPT

INTRODUCTION

The management of leadtime data to support logistics management is, and has been, a difficult task. The changing market for raw/semi-finished materials and industry capacity limitations has had a detrimental effect on the currency and validity of leadtime data. For many materials and industries, it has been truly a seller's market.

Information on material shortages and industry capacity is available; however, it is very difficult to assess the impact of those problems on the logistic system. The Commodity Command Standard System (CCSS) does not provide a system coding a given NSN to identify the critical materials and processes.[1] If there was a coding system which described critical materials (i.e., titanium, cobalt, etc.), processes (i.e., forgings, castings, etc.), and subcomponents (i.e., hearings, hydraulic actuators, etc.), which affect leadtime for a given NSN it would improve visibility in leadtime management. When a manager received information that the availability of material had increased/decreased he could inquire CCSS to obtain a listing of those NSN's that would be affected, and, through in-house review or queries to prime/secondary contractors, validate the impact and modify the leadtimes accordingly. The same process could be enacted for processes as related to constrained industry capacity. Presently the manager could not accomplish this except for those few items that he may be intimately familiar with. The actual manufacturing time to produce an item generally does not change; however, the time that a contractor requires to obtain materials and to schedule work requirement into a manufacturing process varies significantly.

Within the remaining portion of this document a presentation of the concept of Generic Coding is provided as proposed method of improving the visibility in the management of leadtimes. TSARCOM has been requested by DARCOM to coordinate this concept with the other MSC's to obtain their input on assessment of this concept.

[1]CCSS does have a narrative sector 21/02 which may list materials.

GENERIC CODE CONCEPT

The 1970's have shown production leadtimes (PLT) to be unstabled, a trend which is expected to continue indefinitely. The aerospace and defense industrial boom, foreign country political instability, and economic problems have caused PLT's to increase significantly. Updating the PLT data in the Commodity Command Standard System (CCSS) has continually fallen behind actual leadtime experience at all the Major Subordinate Commands (MSC).

Every secondary item and most major items have their PLT updated using data from the last representative buy. In special situations, a PLT can be manually changed. However, when a specific commodity (i.e., titanium forging) or component (i.e., electrical connectors) experiences a drastic PLT increase/decrease, a list of affected NSN's must be made and then each one must be updated by manual change. This procedure is literally impossible, since we do not have the capability to obtain a list of all active NSN's that have a specific commodity or component. In some instances, thousands of items may be affected.

At TSARCOM, we have made an extensive effort to improve our system for tracking leadtime data. Visits to many of our prime contractors revealed they were very concerned and actively working on solutions. With no apparent knowledge of the course being taken by other corporations, nearly all the contractors have come to the same conclusion, and are all moving in the same direction. In nearly each case, suppliers with large and rapidly growing master data files were found moving toward leadtime management by commodity or generic coding. Commodity codes covered the material content of items, and generic codes included manufacturing process and components in addition to material content. Within the DARCOM community, the ever-increasing number of items managed by the MSC's make it prohibitive to accurately update PLT by NSN. We therefore recommend a parallel effort to that being developed in industry; specifically to add generic identification numbers to our current system. This system will be applicable to all secondary items and most major items managed by the MSC's.

A workable example in the use of a generic identification number for each NSN is one with nine (9) digits, divided into three (3) categories:

XX - XX - XXXXX

Materiel

Manufacturing Process

Component

If we assume we have an item made from a medium titanium forging and containing electrical connectors which may cause leadtime difficulties, the number may be:

37 - 32 - 20100

Titanium

Medium Forging

Electrical Connector

The numbers for titanium and medium forging have been arbitrarily selected. The component code was selected from a potentially useable source, the Government-Industry Data Exchange Program (GIDEP) publication titled "Codes for Establishing Index Numbers-Section 9," July 1976. If one or more of the categories are not appropriate for an item, X's may be used to denote none. For example:

37 - 32 - XXXXX

Titanium

Medium Forging

None

To effectively incorporate the new concept into CCSS, it will be necessary for DARCOM to coordinate with the Cataloging, Provisioning, Maintenance, Supply Management and Procurement/Production communities. The NSN's in CCSS need to be coded.

New NSN's added to the files will require the added information during the provisioning process. When a Value Engineering Change Proposal (VECP) is submitted for an item, the number will need to be reviewed and, if necessary, changed. Computer transactions will need to be developed to produce listings of NSN's in a specific category or any combination of two to three categories. Additionally, if a commodity's or component's leadtime has significantly changed, a means must be provided to update all NSN's affected by increasing or decreasing their PLT's by a specified number of months.

APPENDIX D

STRATEGIC, CRITICAL, AND PRECIOUS MATERIALS LIST

ALUMINUM	OSMIUM
ANTIMONY	PALLADIUM
ASBESTOS	PLATINUM
BERYLLIUM	QUARTZ CRYSTAL
CADMIUM	RHODIUM
CHROMIUM	RUBY
COBALT	RUTHENIUM
COLUMBIUM (NIOBIUM)	RUTILE
COPPER	SAPPHIRE
DIAMOND	SILICON CARBIDE
FLUORSPAR	SILVER
GOLD	TALC
GRAPHITE	TANTALUM
IRIDIUM	THORIUM NITRATE
LEAD	TIN
MANGANESE	TITANIUM
MICA	TUNGSTEN
MOLYBDENUM	VANADIUM
NICKEL	ZINC

APPENDIX E

DEPARTMENT OF THE ARMY
HEADQUARTERS US ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND
5001 EISENHOWER AVENUE. ALEXANDRIA. VA. 22333

DRCSM-WRS

14 MAY 1982

SUBJECT: Generic Coding

Commander
US Army Troop Support and Aviation Materiel Readiness Command
St. Louis, MO 63120

1. The Logistics Studies Office at Fort Lee is proceeding with their evaluation of the concept of generic coding as a way to improve the accuracy of production leadtimes used in requirements computations and the development of delivery schedules for secondary items.

2. As a result of recent meetings on this subject at both Fort Lee and TSARCOM, it is apparent that a live test of this concept on selected aviation weapon systems is appropriate.

3. This letter constitutes formal approval for your command to use generic coding on the weapon systems of your choice. We will provide policy guidance from this headquarters as required and you can continue to work directly with the Logistics Studies Office as their effort and your test continue.

4. The Point of Contact at this headquarters is Mr. D. J. Maksymowicz, AUTOVON 284-9802.

FOR THE COMMANDER:

JAMES S. WELCH
Major General, USA
Director of Supply, Maintenance,
and Transportation

CF:
Commandant, Logistics Studies Office, ATTN: DRXSY-FLSO, Fort Lee, VA 23801
Commander, TSARCOM, ATTN: DRSTS-PLE, DRSTS-SP, St. Louis, MO 63120

APPENDIX F

DEPARTMENT OF THE ARMY
HQ, US ARMY TROOP SUPPORT & AVIATION MATERIEL READINESS COMMAND
4300 GOODFELLOW BOULEVARD, ST. LOUIS, MO 63120

DRSTS-PLET

7 July 1982

SUBJECT: Preliminary List of Materials, Components and Processes

Commander
US Army Materiel Systems Analysis Activity
Logistics Study Office
ATTN: DRXSY-FLSO, Pete Higgins
Fort Lee, Virginia 23801

1. Attached is a preliminary list of materials, components and processes. This list will form a base line for the live test to be performed at this Command. In some cases it is known that more discrete definitions will need to be applied. For example, the definition between large and small forgings for steel will most probably be different for titanium for two reasons; the strength to weight ratio is significantly different and industrial capacity is constrained at different boundry levels.

2. As the preliminary version of the live test plan is finalized it will be forwarded for your information.

FOR THE COMMANDER:

1 Incl
as

RICHARD C. GREEN
Chief, Production Technical Services Section

COMPONENTS

Bearings
Electrical Connectors
Hydraulic Bodies

PROCESSES

Forgings (Small) (Aluminum/Steel)
Forgings (Large) (Aluminum/Steel)
Forgings (Small) (Titanium)
Forgings (Large) (Titanium)
Rolled & Welded Rings
Rolled & Welded Rings (Titanium)
Castings Large
Castings Small
Machinings Large
Machinings Large (Titanium)
Machinings Small
Machinings Small (Titanium)
Bearings Shaft
Bearings Gearbox
Fasteners
Tubes
Tubes (Titanium)
Airfoils Cast & Machined
Airfoils Forged & Machined Titanium
Hot Isostatic
Composite Cure

MATERIALS

Aluminum
Antimony
Beryllium
Cadium
Cobalt
Columbium
Copper
Graphite
Iridium
Lead
Manganese
Molybdenum
Nickel
Osmium
Palladium
Platinum
Rhodium
Ruthenium
Tantalum
Titanium
Tungsten
Vanadium
Chromium

APPENDIX G

SYSTEM DEMONSTRATION

1. The data base for this program consists of 27 entries or codes. Twenty different NSNs are represented by three different material types, three different processes, and seven different subcomponents. Of the entries, ten have no critical material, process, or subcomponent. These ten NSNs comprise the "not-included" set of NSNs. For search efficiency, two separate files of NSNs were proposed in the report. In the example below, one data base was created to contain both the included and excluded NSNs. If the data base of the system as implemented is relatively small (less than 10000 entries), it also could function adequately with only one data base.

2. Note that the file is in NSN sequence. Additions to the file will be appropriately sequenced by the program.

a. The starting data base is shown below.

MAT	PRO	SCOMP	NSN
004	000	000	0000-00-000-0000
003	000	00E	0000-00-000-0000
*	*	*	0000-00-000-9999
002A1S00F		00B	1111-11-111-1111
002A2000E		00B	1111-11-111-1111
*	*	*	1111-11-111-8888
002	00G	00C	2222-22-222-2222
*	*	*	2222-22-222-7777
000	00F	00C	3333-33-333-3333
*	*	*	3333-33-333-6666
000	00F	00D	4444-44-444-4444
004	000	000	4444-44-444-4444
*	*	*	4444-44-444-5555
*	*	*	5555-55-555-4444
003	00E	00E	5555-55-555-5555
*	*	*	6666-66-666-3333
003	00F	00C	6666-66-666-6666
004	000	000	6666-66-666-6666
*	*	*	7777-77-777-2222
000	00F	000	7777-77-777-7777
*	*	*	8888-88-888-1111
000	000	00CA1S8888-88-888-8888	
000	000	00FA208888-88-888-8888	
000	000	00GB2S8888-88-888-8888	
000	000	00HB208888-88-888-8888	
*	*	*	9999-99-999-0000
000	00G	000	9999-99-999-9999

b. On the Hewlett-Packard 3000 Computer the program is accessed by:

(1) Entering the appropriate user identifier codes.

(2) Calling for BASIC.

(3) Entering "GET XNSN", to get the specific program.

(4) Entering "RUN".

3. The following examples demonstrate the capabilities of a simple program. Note that the program is interactive; that is, the user responds to the computer's questions. No computer expertise is required of the user and little skill is needed to perform the manipulations demonstrated below.

a. The example below demonstrates a typical search of the data base for all NSNs that have a material coded 003. User entries are underlined.

```
>GET XNSN

>RUN

XNSN

PLEASE ENTER A FUNCTION:  SEARCH, INSERT, DELETE OR HALT.
?SEARCH
PLEASE ENTER THE MATERIAL OR HIT RETURN.
003
PLEASE ENTER THE PROCESS OR HIT RETURN.

PLEASE ENTER THE SUBCOMPONENT OR HIT RETURN.

PLEASE ENTER THE NSN OR HIT RETURN.

003        000        00E        0000-00-000-0000
003        00E        00E        5555-55-555-5555
003        00F        00C        6666-66-666-6666
END OF FILE REACHED; 3 RECORD(S) FOUND.
```

THREE CODES WERE EXTRACTED.

b. The next example demonstrates a search for a process (00E)-

```
PLEASE ENTER A FUNCTION:  SEARCH, INSERT, DELETE OR HALT.
?SEARCH
PLEASE ENTER THE MATERIAL OR HIT RETURN.

PLEASE ENTER THE PROCESS OR HIT RETURN.
00E
PLEASE ENTER THE SUBCOMPONENT OR HIT RETURN.
```

```
PLEASE ENTER THE NSN OR HIT RETURN.

002A20        00E        00B        1111-11-111-1111
003           00E        00E        5555-55-555-5555
END OF FILE REACHED; 2 RECORD(S) FOUND.
```

c. The next example demonstrates a search for a subcomponent (00D) -

```
PLEASE ENTER A FUNCTION:  SEARCH, INSERT, DELETE OR HALT.
?SEARCH
PLEASE ENTER THE MATERIAL OR HIT RETURN.

PLEASE ENTER THE PROCESS OR HIT RETURN.

PLEASE ENTER THE SUBCOMPONENT OR HIT RETURN.
00D
PLEASE ENTER THE NSN OR HIT RETURN.

000        00F        00D        4444-44-444-4444
END OF FILE REACHED; 1 RECORD(S) FOUND.
```

d. The next example demonstrates a search for an NSN (8888-88-888-8888) -

```
PLEASE ENTER A FUNCTION:  SEARCH, INSERT, DELETE OR HALT.
?SEARCH
PLEASE ENTER THE MATERIAL OR HIT RETURN.

PLEASE ENTER THE SUBCOMPONENT OR HIT RETURN.

PLEASE ENTER THE NSN OR HIT RETURN.
8888-88-888-8888
000        000        00CA1S        8888-88-888-8888
000        000        00FA20        8888-88-888-8888
000        000        00GB2S        8888-88-888-8888
000        000        00HB20        8888-88-888-8888
END OF FILE REACHED; 4 RECORD(S) FOUND.
```

(Note: Either "SEARCH, INSERT, DELETE, HALT" or the first letter (S, I, D, H) of the commands may be used as the response to the computer query.)

e. The next example demonstrates an insertion of a new code -

```
004        000        000        9999-99-999-1111

PLEASE ENTER A FUNCTION:  SEARCH, INSERT, DELETE OR HALT.
?INSERT
PLEASE ENTER THE MATERIAL.
?004
PLEASE ENTER THE PROCESS.
?000
PLEASE ENTER THE SUBCOMPONENT.
?000
PLEASE ENTER THE NSN.
?9999-99-999-1111
RECORD HAS BEEN ADDED
```

f. The next example demonstrates a deletion of a code, 003 000 00E 0000-00-000-0000. Note that to delete a code, a deletion password is required to insure that an entry is not deleted in error and that only personnel with the authority to do so can delete.

```
PLEASE ENTER A FUNCTION:  SEARCH, INSERT, DELETE OR HALT.
?DELETE
PLEASE ENTER THE MATERIAL.
?003
PLEASE ENTER THE PROCESS.
?000
PLEASE ENTER THE SUBCOMPONENT.
?00E
PLEASE ENTER THE NSN
?0000-00-000-0000
PLEASE ENTER THE DELETION PASSWORD
?$EXTRACT
IT HAS BEEN DELETED
```

g. The last example demonstrates the "HALT" command -

```
PLEASE ENTER A FUNCTION:  SEARCH, INSERT, DELETE OR HALT.
?HALT

END OF PROGRAM
```

4. At the end of the above actions the data base is as shown below.

MAT	PRO	SUB COMP	NSN	
004	000	000	0000-00-000-0000	←Deletion
*	*	*	0000-00-000-9999	
002A1S	00F	00B	1111-11-111-1111	
002A2	:00E	00B	1111-11-111-1111	
*	*	*	1111-11-111-8888	
002	00G	00C	2222-22-222-2222	
*	*	*	2222-22-222-7777	
000	00F	00C	3333-33-333-3333	
*	*	*	3333-33-333-6666	
000	00F	00D	4444-44-444-4444	
004	000	000	4444-44-444-4444	
*	*	*	4444-44-444-5555	
*	*	*	5555-55-555-4444	
003	00E	00E	5555-55-555-5555	
*	*	*	6666-66-666-3333	
003	00F	00C	6666-66-666-6666	
004	000	000	6666-66-666-6666	
*	*	*	7777-77-777-2222	
000	00F	000	7777-77-777-7777	
*	*	*	8888-88-888-1111	
000	000	00CA1S	8888-88-888-8888	

```
                    SUB
MAT     PRO         COMP          NSN

000     000         00FA208888-88-888-8888
000     000         00GB2S8888-88-888-8888
000     000         00HB208888-88-888-8888
*       *           *      9999-99-999-0000
004     000         000    9999-99-999-1111 <------ Addition
000     00G         000    9999-99-999-9999
```

PROGRAM LISTING BEGINS NEXT PAGE.

```
XNSN
  10 REM FILE BOOKEEPING
  20 FILES NSNFILE,*
  30 REM DIMENSION STATEMENTS
  40 DIM P$[8],U$[8]
  50 DIM F$[4,16]
  60 DIM L$[80]
  70 DIM A$[6]
  80 DIM S[4]
  90 DIM C$[4,12]
 100 DIM B[4]
 110 REM INITIALIZE VARIABLES
 120 C$[1]="MATERIAL"
 130 C$[2]="PROCESS"
 140 C$[3]="SUBCOMPONENT"
 150 C$[4]="NSN"
 160 P$="$EXTRACT"
 170 REM START THE FUNCTION LOOP.
 180 ASSIGN "NSNFILE",1,X
 190 SYSTEM X,"BUILD TEMPFILE;REC=-80,,,ASCII;DISC=5000"
 200 ASSIGN "TEMPFILE",2,X
 210 REM DETERMINE THE FUNCTION
 220 PRINT LIN(2);&
     "PLEASE ENTER A FUNCTION:  SEARCH, INSERT, DELETE OR HALT."
 230 F=0
 240 C=0
 250 INPUT A$
 260 IF A$="SEARCH" OR A$="S" THEN F=1
 270 IF A$="INSERT" OR A$="I" THEN F=2
 280 IF A$="DELETE" OR A$="D" THEN F=3
 290 IF A$="HALT" OR A$="H" THEN 1190
 300 IF NOT (F=1 OR F=2 OR F=3) THEN DO
 310   PRINT "ONLY SEARCH, INSERT, DELETE OR HALT ARE ALLOWED."
 320   GOTO 220
 330 DOEND
 340 REM DETERMINE THE KEYS.
 350 MAT S=ZER
 360 D=0
 370 FOR I=1 TO 4
 380   IF F=1 THEN DO
 390     PRINT "PLEASE ENTER THE ";C$[I];" OR HIT RETURN."
 400     LINPUT F$[I]
 410     IF F$[I]="" THEN S[I]=0
 420     ELSE S[I]=1
 430     IF S[I]=1 THEN D=1
 440   DOEND
 450   ELSE DO
 460     D=1
 470     PRINT "PLEASE ENTER THE ";C$[I];"."
 480     S[I]=1
 490     INPUT F$[I]
 500   DOEND
 510 NEXT I
 520 IF D=0 THEN 1190
 530 REM BEGIN THE SEARCH ROUTINE
 540 ON END #1 THEN 780
 550 LET E=G=1
 560 LINPUT #1;L$
 570 MAT B=ZER
 580 REM SEARCHING LOGIC PERMITTING CROSS REFERENCING OF
```

```
590 REM SUBFIELDS. E=1 MEANS EQUAL; G=1 MEANS GREATER
600 REM THAN; E=1 AND G=1 MEANS END OF FILE.
610 IF F=3 THEN DO
620   IF L$[1,6]=F$[1,1,6] THEN B[1]=1
630   IF L$[7,12]=F$[2,1,6] THEN B[2]=1
640   IF L$[13,15]=F$[3,1,3] THEN B[3]=1
650 DOEND
660 ELSE DO
670   IF L$[1,3]=F$[1,1,3] THEN B[1]=1
680   IF L$[7,9]=F$[2,1,3] THEN B[2]=1
690   IF L$[13,15]=F$[3,1,3] THEN B[3]=1
700 DOEND
710 IF L$[19,34]=F$[4,1,16] THEN B[4]=1
720 IF NOT (L$[19,34]>F$[4,1,16]) OR F=1 THEN G=0
730 FOR I=1 TO 4
740   IF NOT (B[I]=1) AND S[I]=1 THEN E=0
750 NEXT I
760 REM BRANCH TO FUNCTION SUBROUTINES
770 IF G=1 OR E=1 THEN DO
780   IF F=1 THEN 1090
790   IF F=2 THEN 840
800   IF F=3 THEN 890
810 DOEND
820 PRINT #2;L$
830 GOTO 530
840 REM THIS IS THE INSERT FUNCTION ROUTINE.
850 PRINT #2;F$[1,1,6]+F$[2,1,6]+F$[3,1,6]+F$[4]
860 PRINT "RECORD HAS BEEN ADDED"
870 IF E=1 AND G=1 THEN 1230
880 ELSE 1210
890 REM THIS IS THE DELETE FUNCTION ROUTINE
900 IF G=1 THEN DO
910   IF C=0 THEN PRINT "RECORD NOT FOUND"
920   PRINT USING 1290;C
930   IF E=1 THEN 1230
940   ELSE 1210
950 DOEND
960 ELSE DO
970   C=C+1
980   PRINT "PLEASE ENTER THE DELETION PASSWORD"
990   INPUT U$
1000  IF U$=P$ THEN DO
1010    PRINT "IT HAS BEEN DELETED"
1020    GOTO 1190
1030  DOEND
1040  ELSE DO
1050    PRINT "WRONG PASSWORD.  START OVER."
1060    GOTO 1210
1070  DOEND
1080 DOEND
1090 REM THIS IS THE SEARCH FUNCTION ROUTINE.
1100 IF E=1 AND G=1 THEN DO
1110  PRINT USING 1290;C
1120  GOTO 1230
1130 DOEND
1140 IF E=1 THEN DO
1150  C=C+1
1160  PRINT L$[1,6]+"     "+L$[7,12]+"    "+L$[13,18]+"    "+L$[19,34]
1170 DOEND
1180 GOTO 820
```

```
1190 ON END #1 THEN 1230
1200 LINPUT #1;L$
1210 PRINT #2;L$
1220 GOTO 1190
1230 ASSIGN *,1
1240 ASSIGN *,2
1250 SYSTEM X,"PURGE NSNFILE"
1260 SYSTEM X,"RENAME TEMPFILE,NSNFILE"
1270 IF NOT (F=0) THEN 170
1280 PRINT LIN(2);"END OF PROGRAM"
1290 IMAGE "END OF FILE REACHED: ",2D," RECORD(S) FOUND."
1300 END
```

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